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Governor

# ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

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Stephen A. Owens  
Director

## Assessment of Qualification for Treatment under the Arizona Natural and Exceptional Events Policy for the High Particulate (PM<sub>10</sub>) Concentration Events in the Nogales, Arizona Area on November 18, 2007

### Background

The Arizona Department of Environmental Quality (ADEQ) operates monitors at the Post Office in Nogales, Arizona for PM<sub>10</sub> and PM<sub>2.5</sub> and at the Fire Station in Nogales, Sonora for PM<sub>10</sub>. Federal Reference Method (FRM) filter-based samples are collected at both locations. Beta-Attenuation Monitor Systems (BAMS) collect hourly concentration data at the Post Office site.

During the evening of November 18, 2007, a strong night-time temperature inversion set up in the Nogales area. With no significant ventilating winds available to break up the surface inversion, the inversion intensified and set up a drainage flow from the higher terrain to the south in Mexico through Nogales, Sonora and into Nogales, Arizona.

The event brought significant elevated ambient concentrations of PM<sub>10</sub> that exceeded the National Ambient Air Quality Standards (NAAQS) at the ADEQ Nogales

Post Office monitors (BAMS). The fact that ambient concentrations exceed the NAAQS satisfies the criteria in 40 CFR 50.1(j) that the event “affects air quality.”

Preliminary indications were that emissions from sources in Mexico, which are not subject to control by the Arizona state implementation plan (SIP), may have contributed to the event.

A PM<sub>10</sub> SIP exists for Nogales, Arizona. All appropriate SIP control measures were in place during the event demonstrating, per 40 CFR 50.1(j), that the event “is not reasonably controllable or preventable,” if in fact emissions from Mexico caused the exceedance.

Elevated PM<sub>10</sub> and PM<sub>2.5</sub> concentrations were measured in the Nogales area. The following are the key PM monitor readings for the monitors examined in this report:

Monitor (Operator/Type)	AQS ID*	24-hr Avg PM <sub>10</sub> or PM <sub>2.5</sub>	1-hr Max PM <sub>10</sub> or PM <sub>2.5</sub>	Time of Max 1-hr	Flag**
<b>NOGALES AREA</b>					
<b>Nogales AZ Post Office PM<sub>10</sub> (ADEQ/BAM)</b>	<b>04-023-0004 (3)</b>	<b>167</b>	<b>628</b>	<b>1900</b>	<b>RL</b>
<b>Nogales AZ Post Office PM<sub>2.5</sub> (ADEQ/BAM)</b>	<b>04-023-0004 (3)</b>	<b>19.3</b>	<b>65</b>	<b>1900</b>	<b>None</b>

\* EPA Air Quality System Identification Number

\*\* 24-hr PM<sub>10</sub> concentration influenced by exceptional event (international transport) to be flagged.

Type Abbreviations: BAM – Beta-Attenuation Mass Monitor (Continuous monitor)

The preliminary findings from this analysis were presented at a stakeholders meeting on June 11, 2008, in Phoenix, Arizona, and on June 17, 2008, in Nogales, Arizona. Public comment was solicited on the preliminary findings from May 28 through June 26, 2008. During that time, no comments were received from the public. ADEQ has

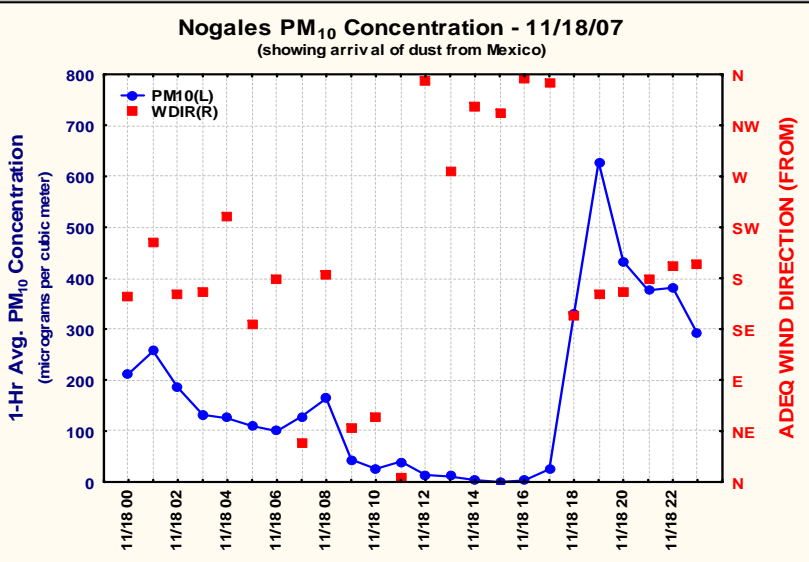
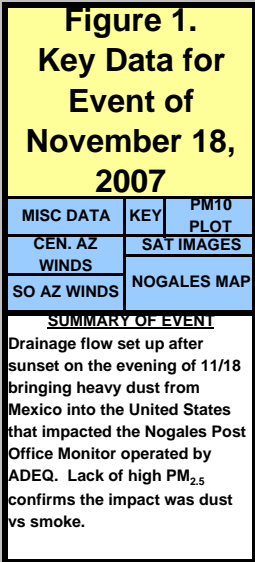
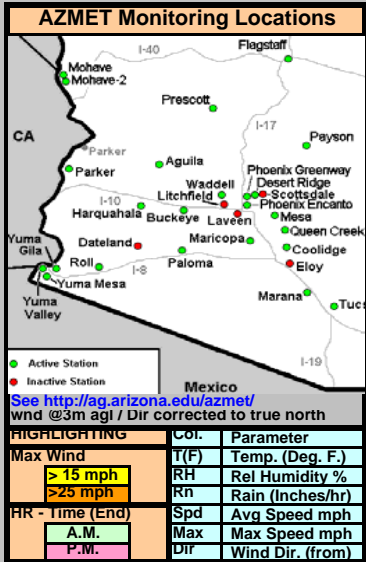
finalized this demonstration, which was made available for public comment from August 11, 2008, through September 10, 2008. Any comments that were received were forwarded to EPA with this demonstration pursuant to 40 CFR 50.14(c)(3)(i).

CENTRAL PHOENIX							
	Hr	T(F)	RH	Rn	Spd	Max	Dir
15-Phx Encanto	1	55	72	-	0	2	N
	2	55	70	-	0	2	N
	3	53	72	-	0	0	N
	4	53	69	-	0	1	N
	5	51	72	-	1	2	N
	6	51	73	-	0	0	NW
	7	49	77	-	0	1	NE
	8	50	78	-	0	0	NE
	9	60	56	-	2	6	SE
	10	66	41	-	2	5	E
	11	72	32	-	2	6	E
	12	76	25	-	2	5	SE

SOUTHEAST PHOENIX							
	Hr	T(F)	RH	Rn	Spd	Max	Dir
22-Queen Creek	1	49	78	-	2	4	SE
	2	48	76	-	2	4	SE
	3	49	72	-	4	5	SE
	4	48	72	-	2	4	SE
	5	49	68	-	2	4	E
	6	47	74	-	2	4	SE
	7	45	82	-	0	2	S
	8	48	78	-	0	2	NE
	9	58	53	-	1	3	SW
	10	64	46	-	3	5	S
	11	70	35	-	2	4	S
	12	74	29	-	2	4	SE

NOGALES AIRPORT							
	Hr	T(F)	VR	Dust	Spd	Gust	Dir
NWS-Nogales	1	48	10	-	5	5	E
	2	46	10	-	0	0	E
	3	45	10	-	0	0	E
	4	42	10	-	0	0	E
	5	43	10	-	3	3	SE
	6	41	10	-	0	0	E
	7	42	10	-	0	0	E
	8	46	10	-	0	0	E
	9	56	10	-	0	0	E
	10	64	10	-	5	5	S
	11	72	10	-	3	3	SW
	12	76	10	-	5	5	SW

Event Contrib. Analysis				
Hourly PM <sub>10</sub> Conc. (µg/m <sup>3</sup> )				
MONITORS:		Hr	1	
1-NOG PO (BAMS)		1	212	
		2	257	
		3	185	
		4	132	
		5	125	
24-Hr. Avg PM <sub>10</sub>		6	110	
Monitor: with I/w/o		7	100	
1-NOG P		8	129	
		9	164	
		10	44	
> NAAQS		11	26	
Pink=Event Contrib.		12	40	
Conclusion: As shown above, the PM <sub>10</sub> concentration would have been below the NAAQS "BUT FOR" the event contribution (hours highlighted in pink).				
		1	14	
		2	11	
		3	4	
		4	0	
		5	3	
		6	25	
		7	330	
		8	628	
		9	433	
		10	376	
		11	381	
		12	291	

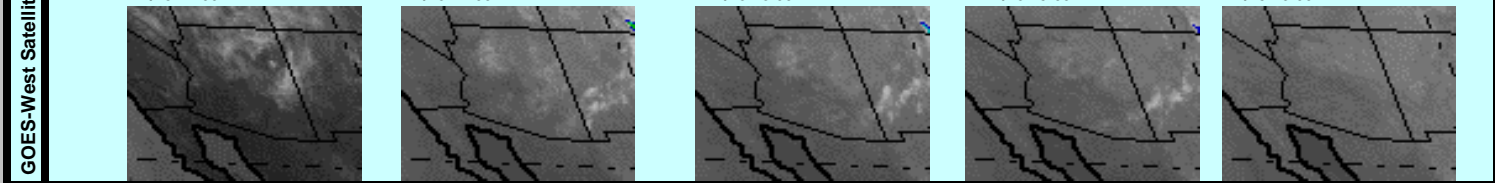


PARKER							
	Hr	T(F)	RH	Rn	Spd	Max	Dir
08-Parker	1	53	61	-	2	4	N
	2	52	68	-	1	3	NE
	3	50	66	-	2	4	N
	4	49	68	-	1	4	N
	5	48	70	-	2	3	N
	6	48	69	-	1	3	N
	7	48	70	-	3	5	NE
	8	48	68	-	3	5	NE
	9	53	62	-	3	5	N
	10	61	45	-	5	7	NE
	11	69	36	-	6	8	N
	12	74	29	-	5	8	N

BUCKEYE							
	Hr	T(F)	RH	Rn	Spd	Max	Dir
26-Buckeye	1	58	40	-	2	5	NE
	2	55	42	-	3	5	N
	3	54	43	-	2	4	N
	4	53	43	-	3	6	NE
	5	53	45	-	3	6	N
	6	50	50	-	1	3	NE
	7	48	51	-	1	3	NE
	8	48	52	-	1	4	N
	9	57	40	-	0	2	N
	10	67	35	-	5	9	E
	11	73	28	-	6	12	E
	12	78	22	-	8	13	E

MARICOPA							
	Hr	T(F)	RH	Rn	Spd	Max	Dir
06-Maricopa	1	58	47	-	4	7	S
	2	53	58	-	1	3	NE
	3	50	62	-	1	3	NW
	4	50	59	-	1	4	NW
	5	47	66	-	1	4	NW
	6	48	62	-	2	4	W
	7	43	72	-	1	3	NE
	8	46	68	-	1	2	E
	9	55	51	-	1	2	SW
	10	63	39	-	1	4	S
	11	70	30	-	2	5	SE
	12	75	25	-	2	5	S

Historical Distribution				
5-Yr. Dist. of Values (µg/m <sup>3</sup> )				
MONITORS:		Column Index		
1-NOG PO (BAMS)		Yr	-	All Data (5-Yrs)
		Sea	-	Data for Autumn season only (5-Yrs)
Cum. Freq.	Mon 1	Yr	Sea	
Min	4	4		
0.5%	8	8		
1.0%	8	10		
2.5%	13	18		
5%	17	21		
10%	22	27		
25%	35	44		
50%	56	75		
75%	96	130		
90%	146	177		
95%	180	199		
97.5%	213	216		
99.0%	244	231		
99.5%	291	238		
Max	351	284		
Flagged Value	167			
Conclusion: Flagged Value is exceptional in nature (eg. greater than 95% of all data)				

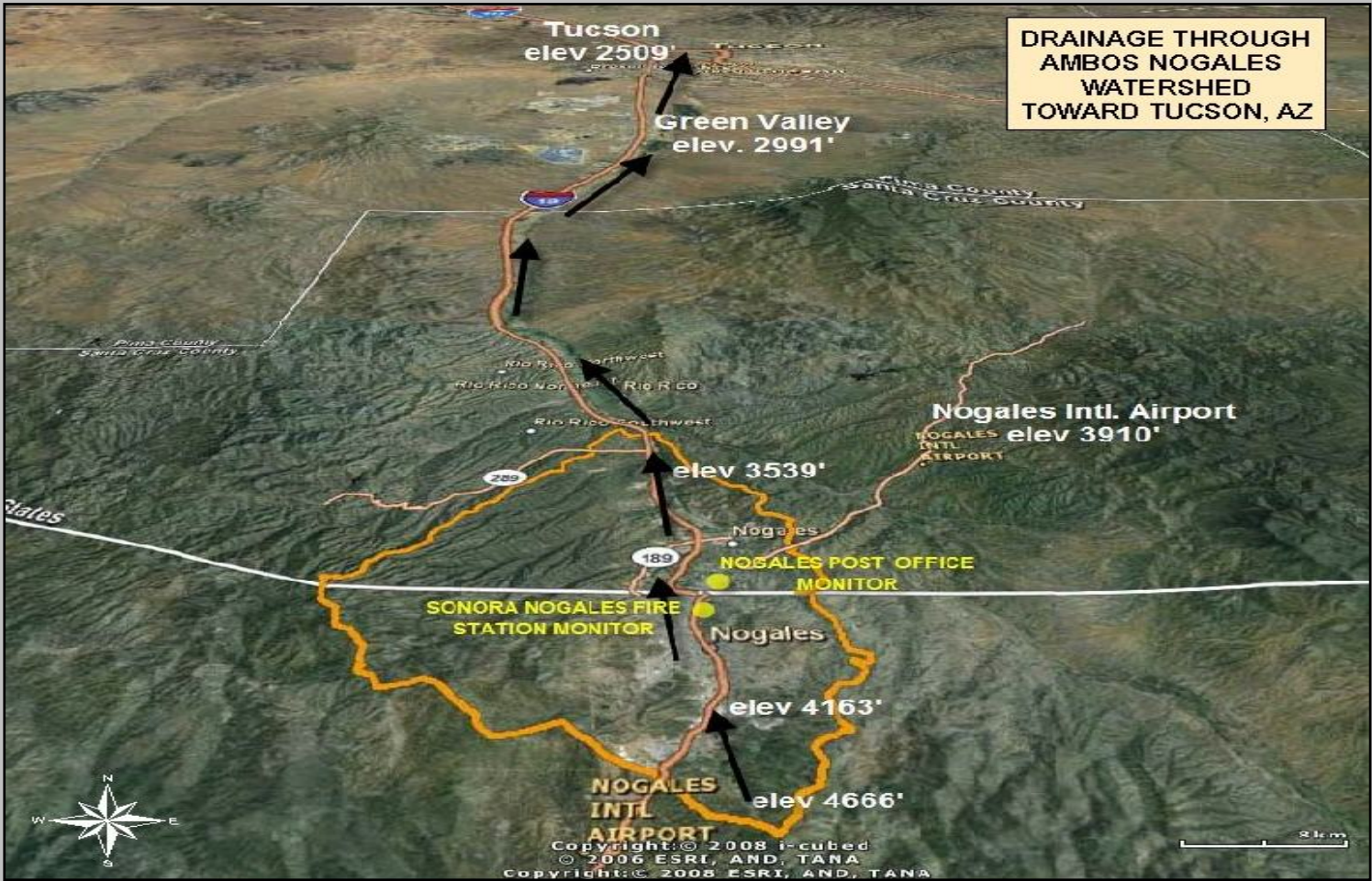


YUMA							
	Hr	T(F)	RH	Rn	Spd	Max	Dir
02-YumaValley	1	58	75	-	0	2	SE
	2	56	75	-	1	2	E
	3	56	74	-	2	3	N
	4	55	74	-	1	3	NE
	5	55	69	-	1	3	NE
	6	54	71	-	1	3	NE
	7	54	68	-	1	3	NE
	8	56	59	-	3	5	NE
	9	59	63	-	3	6	NE
	10	67	45	-	4	8	NE
	11	72	37	-	7	11	NE
	12	78	30	-	7	10	NE

PALOMA							
	Hr	T(F)	RH	Rn	Spd	Max	Dir
19-Paloma	1	52	68	-	2	5	N
	2	50	77	-	1	3	N
	3	50	70	-	1	2	NE
	4	50	70	-	2	5	E
	5	49	69	-	1	4	E
	6	47	75	-	3	5	E
	7	48	70	-	4	7	E
	8	49	68	-	4	5	SE
	9	56	63	-	4	6	SE
	10	62	54	-	3	6	E
	11	68	44	-	2	4	NE
	12	74	33	-	4	6	NE

MARANA							
	Hr	T(F)	RH	Rn	Spd	Max	Dir
13-Marana	1	55	41	-	4	8	SE
	2	55	44	-	5	8	SE
	3	53	48	-	4	7	SE
	4	52	49	-	4	8	SE
	5	51	52	-	5	9	SE
	6	50	54	-	5	8	SE
	7	51	50	-	9	13	SE
	8	52	49	-	10	15	SE
	9	57	40	-	9	16	SE
	10	64	30	-	8	15	SE
	11	71	24	-	6	11	SE
	12	78	19	-	3	6	S

TUCSON							
	Hr	T(F)	RH	Rn	Spd	Max	Dir
01-Tucson	1	50	58	-	1	3	E
	2	49	59	-	1	4	E
	3	47	63	-	1	3	E
	4	45	67	-	1	2	E
	5	44	69	-	1	3	NE
	6	43	70	-	1	4	E
	7	42	73	-	1	3	E
	8	46	64	-	3	6	E
	9	55	49	-	3	5	E
	10	63	40	-	2	4	E
	11	70	29	-	1	3	N
	12	75	25	-	2	5	NW



## Assessment Under the Technical Criteria Document (TCD)

1. Properly qualify and validate the air quality measurement to be flagged. As this was not a filter sampling date (1-in-6 run day), only data from the continuous analyzers were examined. The air quality monitoring data were reviewed by ADEQ, the agency responsible for operation of the monitor. All hourly PM<sub>10</sub> and PM<sub>2.5</sub> readings from the Nogales BAMS monitors were found to be valid for November 18<sup>th</sup>. No specific local sources were reported as significantly contributing to the air quality episode.

2. Review suspected contributing sources. The event began on the evening of November 18<sup>th</sup>. There was not a significant fraction of PM<sub>2.5</sub> measured during this episode. This is typical for the arid southwest, except when smoke from smoldering fires can be a significant source of PM<sub>2.5</sub>. Lack of any significant transport winds would indicate that the emissions are from nearby the monitor. The plot of hourly PM<sub>10</sub> concentration data in the upper right corner of Figure 1, in conjunction with the wind direction data, confirms the identical timing of the transport from the south across the U.S. / Mexico border when the elevated PM concentrations began. It is clear from the PM<sub>2.5</sub> data presented in the table in the Background section of this report that smoke was not a major contributor to this event.

3. Examine all air quality monitoring information. Data from all monitors in the network were reviewed. Monitors from the Nogales area are summarized in the table in the Background section of this assessment. Pursuant to 40 CFR 50.14(c)(3)(iii)(C), the "Historical Distribution" Table in Figure 1 has been included to demonstrate that the event is associated with measured concentrations in excess of normal historical fluctuations, including background (i.e., concentrations greater than the 95<sup>th</sup> percentile).

4. Examine the meteorological conditions before and during the event. Figure 1 includes a map showing the terrain and drainage patterns of the Nogales area. Cold air forming in the mountains south of the U.S. / Mexico border will flow northward into the Santa Cruz River Drainage Basin. National Weather Service data from the Nogales

Airport, northeast of the city, showed calm to light and variable winds in the evening hours from the east or south. The data from ADEQ's wind monitor are included in the PM daily report sheet (see attachments). At the Post Office, winds shifted to being from the south at approximately 6:00 p.m. at 1-2 miles per hour. The concentrations picked up on the evening of November 18<sup>th</sup> when the winds shifted and started moving out of the south. It appears the source is coming from Mexico, since there are no sources in the United States between the monitor and the border.

5. Perform a qualitative attribution to emission source(s). All evidence indicates the elevated PM<sub>10</sub> and PM<sub>2.5</sub> concentrations in the Nogales, Arizona, area can be attributed to dust emissions from sources south of Nogales, Arizona, in Nogales, Sonora. The data available for this analysis do not allow for development of a source specific emission allocation. The hourly concentration data do not show any significant source other than the drainage dust and smoke associated with the event.

6. Estimation of Contribution from Source or Event. The primary source appears to be drainage dust from Mexico for which there is no effective or efficient method to estimate the relative contributions from specific sources. The demonstration analysis contained in this report establishes the linkage between the measurements to be flagged and the event, thus satisfying the requirement in 40 CFR 50.14(c)(3)(iii)(B). Pursuant to 40 CFR 50.14(c)(3)(iii)(D), the "Event Contrib. Analysis" Table in Figure 1 has been included to demonstrate that there would have been no exceedances or violations but for the event (i.e., the contribution during the event overwhelmed the 24-hour average).

7. Determination that a Natural or Exceptional Event Contributed To an Exceedance. Based on this analysis, the event satisfies the requirement in 40 CFR 50.1(j) that the elevated concentration at the Nogales Post Office monitor was attributed to an exceptional event caused by international transport of emissions into the United States.

## Conclusion

International transport of emissions. The elevated PM<sub>10</sub> event on November 18, 2007, in Nogales, Arizona, was the result of emissions from Mexico which were transported into the United States in a slow moving drainage flow originating in the mountains south of Nogales, Sonora.

The fact that all appropriate SIP control measures were in place and emissions from international transport caused the exceedance demonstrates that, per 40 CFR 50.1(j), that the event "is not reasonably controllable or preventable."

The "other" flag (RL) was applied to the PM<sub>10</sub> measurements, as the monitors would have been below the NAAQS but for the contribution of the event.

U.S. Department of Commerce  
National Oceanic & Atmospheric Administration

**QUALITY CONTROLLED LOCAL  
CLIMATOLOGICAL DATA  
(final)  
HOURLY OBSERVATIONS TABLE  
NOGALES INTERNATIONAL ARPT (03196)  
NOGALES , AZ  
(11/2007)**

National Climatic Data Center  
Federal Building  
151 Patton Avenue  
Asheville, North Carolina 28801

Elevation: 3908 ft. above sea level

Latitude: 31.421

Longitude: -110.846

Data Version: VER2

Date	Time (LST)	Station Type	Sky Conditions	Visibility (SM)	Weather Type	Dry Bulb Temp		Wet Bulb Temp		Dew Point Temp		Rel Humd %	Wind Speed (MPH)	Wind Dir	Wind Gusts (MPH)	Station Pressure (in. hg)	Press Tend	Net 3-hr Chg (mb)	Sea Level Pressure (in. hg)	Report Type	Precip. Total (in)	Alti- meter (in. hg)
						(F)	(C)	(F)	(C)	(F)	(C)											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
18	0054	12	CLR	10.00		48	8.9	40	4.6	31	-0.6	52	5	080		26.07			29.96	AA		30.10
18	0154	12	CLR	10.00		46	7.8	39	4.0	31	-0.6	56	0	000		26.07			29.96	AA		30.10
18	0254	12	CLR	10.00		45	7.2	38	3.5	30	-1.1	56	0	000		26.06	6	003	29.96	AA		30.09
18	0354	12	CLR	10.00		42	5.6	37	2.6	30	-1.1	63	0	000		26.06			29.97	AA		30.09
18	0454	12	CLR	10.00		43	6.1	37	2.9	30	-1.1	60	3	150		26.07	3	000	29.98	AA		30.10
18	0554	12	CLR	10.00		41	5.0	37	2.5	31	-0.6	68	0	000		26.07			30.01	AA		30.11
18	0654	12	CLR	10.00		42	5.6	37	2.6	30	-1.1	63	0	000		26.09			30.05	AA		30.13
18	0754	12	CLR	10.00		46	7.8	40	4.2	32	0.0	58	0	000		26.11	3	016	30.07	AA		30.15
18	0854	12	CLR	10.00		56	13.3	44	6.8	31	-0.6	39	0	000		26.12			30.06	AA		30.16
18	0954	12	CLR	10.00		64	17.8	48	8.8	31	-0.6	29	5	160		26.12			30.05	AA		30.16
18	1054	12	CLR	10.00		72	22.2	51	10.3	29	-1.7	20	3	220		26.11	8	001	30.02	AA		30.15
18	1154	12	CLR	10.00		76	24.4	52	10.9	27	-2.8	16	5	230		26.08			29.98	AA		30.12
18	1254	12	CLR	10.00		79	26.1	53	11.6	27	-2.8	15	3	210		26.06			29.95	AA		30.09
18	1354	12	CLR	10.00		80	26.7	53	11.8	27	-2.8	14	0	000		26.04	6	024	29.93	AA		30.07
18	1454	12	CLR	10.00		81	27.2	53	11.9	26	-3.3	13	3	290		26.03			29.92	AA		30.06
18	1554	12	CLR	10.00		81	27.2	53	11.9	26	-3.3	13	3	320		26.03			29.92	AA		30.06
18	1654	12	CLR	10.00		78	25.6	52	11.2	26	-3.3	15	3	330		26.04	5	001	29.93	AA		30.07
18	1754	12	CLR	10.00		66	18.9	48	8.7	28	-2.2	24	6	070		26.05			29.98	AA		30.08
18	1854	12	CLR	10.00		66	18.9	48	8.7	28	-2.2	24	10	040		26.06			29.99	AA		30.09
18	1954	12	CLR	10.00		62	16.7	46	7.5	27	-2.8	26	3	120		26.07	1	010	30.00	AA		30.10
18	2054	12	CLR	10.00		62	16.7	46	7.7	28	-2.2	28	0	000		26.07			29.99	AA		30.11
18	2154	12	CLR	10.00		57	13.9	44	6.4	28	-2.2	33	0	000		26.09			30.00	AA		30.13
18	2254	12	CLR	10.00		52	11.1	41	4.9	27	-2.8	38	0	000		26.08	0	007	29.99	AA		30.12
18	2354	12	CLR	10.00		52	11.1	41	5.1	28	-2.2	40	0	000		26.09			29.98	AA		30.13

Dynamically generated Fri Apr 11 13:16:30 EDT 2008 via <http://cdо.ncdc.noaa.gov/qclcd/QCLCD>

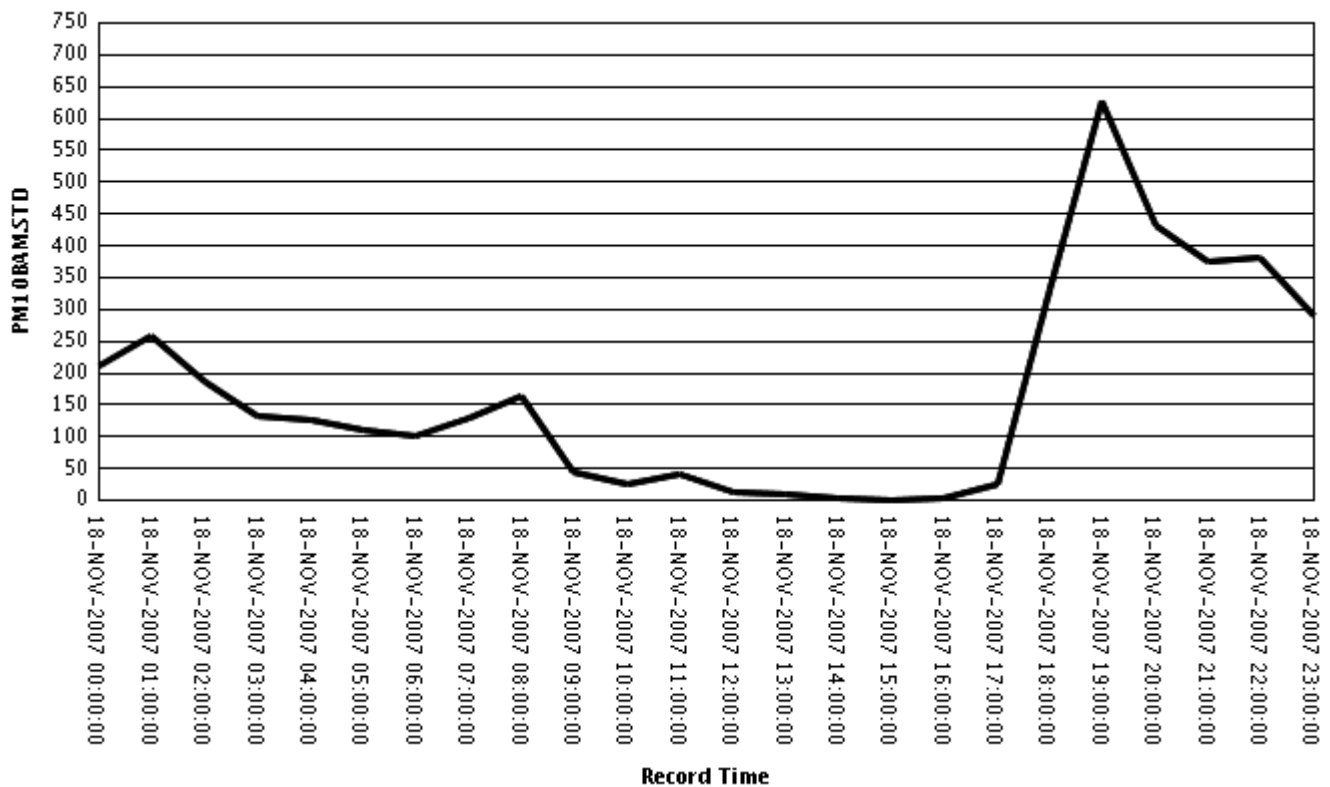
AIR QUALITY DIVISION  
PM10BAM.STD Daily Concentration Report (ug/m3)

04/10/2008

For 11/18/2007  
Preliminary Data QA LEVEL - 2

Place ID: 16511

Name: NOGALES POST OFFICE



Record Time	PM Average	Wind Speed (MPH)	Wind Direction	Temperature(F)	Relative Humidity
18-NOV-2007 00:00:00	212	.9	163		
18-NOV-2007 01:00:00	257	.4	212		
18-NOV-2007 02:00:00	185	.9	165		
18-NOV-2007 03:00:00	132	.4	167		
18-NOV-2007 04:00:00	125	.4	235		
18-NOV-2007 05:00:00	110	.2	139		
18-NOV-2007 06:00:00	100	.2	180		
18-NOV-2007 07:00:00	129	.4	34		
18-NOV-2007 08:00:00	164	1.1	183		
18-NOV-2007 09:00:00	44	2	47		
18-NOV-2007 10:00:00	26	1.1	58		
18-NOV-2007 11:00:00	40	2.5	3		
18-NOV-2007 12:00:00	14	2.5	354		
18-NOV-2007 13:00:00	11	2.9	275		
18-NOV-2007 14:00:00	4	3.1	331		
18-NOV-2007 15:00:00	0	2.7	325		
18-NOV-2007 16:00:00	3	4	356		
18-NOV-2007 17:00:00	25	2.7	353		
18-NOV-2007 18:00:00	330	2	146		
18-NOV-2007 19:00:00	628	2.2	165		
18-NOV-2007 20:00:00	433	2	168		
18-NOV-2007 21:00:00	376	1.3	180		
18-NOV-2007 22:00:00	381	2	191		
18-NOV-2007 23:00:00	291	1.3	192		